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be protected, and then to apply more tar. Mr. Coquillet has proved that the army worm produces three broods in a season, and hibernates in the larva state. Some army worms live as cut worms, never migrating, while others migrate in large armies from field to field, and the writer argues cogently that the migrating worms are a distinct race, the progeny of moths, the caterpillars of which lived in marshes, and acquired the habit of migrating before the annual overflows; while the sedentary worms are bred from moths that for many generations have lived in the same locality. Professor French describes a new wheat-straw worm (*Isosoma allynii*), and gives a most interesting history of the depredations of the boll worms.

THE GEOLOGY OF PHILADELPHIA COUNTY, ETC.<sup>1</sup>—This is among the latest contributions of the Geological Survey and is introduced by a preface of sixteen pages (entitled a letter of transmittal) by Professor Lesley and ninety-four pages of Mr. Hall's report. The first fourteen pages of this latter contain the general remarks of Mr. Hall, with a table of the order of the formations as he conceives them to be, and a condensed summary of his reasons for believing the South Valley Hill rocks and the Philadelphia and Chestnut Hill schists superior to the Chester Valley limestone. The succeeding thirty-three pages are devoted to general descriptions of the formations and contain numerous sketches, small maps and sections. Following these are forty-three pages of township geology, which complete Mr. Hall's part of the volume. The remaining forty-three pages are devoted to the chemical work of Dr. Genth and Mr. F. A. Genth, Jr.

This work is an exceedingly important one because it brings to a head in the work of the Geological Survey of Pennsylvania a difference of theory which has already come to the surface in other parts of this country and indeed in Europe as to the relative ages of various groups of Palæozoic and Eozoic rocks. Professor Lesley in his introduction pays a justly merited tribute to the sagacity of Professor John F. Frazer, of the first Geological Survey of Pennsylvania.

He states, on what ground does not appear in the volume, that the serpentine which Mr. Hall traces to Bryn Mawr, does not continue its south-westwardly course through Delaware and Chester counties, and asserts, that "we can accept the palæozoic age of the Philadelphia rocks with a moderately reserved confidence."

Mr. Hall's argument may be condensed somewhat as follows:

1. "The Philadelphia, Manayunk and Chestnut Hill beds or South Valley Hill, which is equivalent to part of them, cannot be older than the Laurentian." (Roger's third Belt). This will be generally admitted.

<sup>1</sup> *The Geology of Philadelphia county and the southern part of Montgomery and Bucks*, by CHARLES E. HALL; with analyses of rocks by F. A. Genth and F. A. Genth, Jr. Second Geological Survey of Pennsylvania, C. 6.

2. "It is clear that the Potsdam sandstone was deposited on the third belt."

This is not in conformity with numberless observations made in Adams, York, Lancaster and Chester counties as may be seen by consulting the maps and text of reports, C, CC, and CCC and of Chester county when it is published, as well as notes made by Dr. Frazer in the company of Mr. Hall at Harper's Ferry.

3. "But it is equally clear that the mica schists and gneisses are not found between the Primal and the rocks of the third belt." This statement is inconsistent with a whole host of observations on the South mountain and in the counties named above as well as in Cumberland and Franklin.

4. "If the mica schists were older than the Potsdam, they must have been deposited up to a geographical line." Not if there was a fault along the South Valley hill which diverged to the south slightly before reaching the eastern extremity of that valley.

5. "Even supposing a fault \* \* there would still be some remnants of these rocks in their normal position \* \* and fragments \* \* entombed in the Potsdam," &c.

As to the first, abundant demonstration of it exists in the counties above named, and that the second proposition is in accordance with Mr. Hall's observations is clear from the fact, that out of six specimens of his Potsdam or Edge Hill rock sent to the laboratory for analysis, four were named by Dr. Genth and his son "hydro-mica schist;" which proves an abundance of that material in the rock.

Space will not here permit a presentation of the reasons for the opposite view, *i. e.*, that the South Valley Hill rocks belong *below* the limestone. This one consideration may be, however, presented that he who can, may accommodate it to Mr. Hall's theory.

In at least two places in Chester county limited areas of Laurentian rocks are observed to be in contact with the South Valley Hill schists (on this point Mr. Hall and Dr. Frazer are in accord). One of these areas, near West Chester, is completely surrounded by them. The other forms a narrow tongue or peninsula in contact with them on three sides. Yet there is not a sign of any of the thousands of feet of the Huronian, Potsdam or Limestone which ought to appear between them, according to Mr. Hall's view.

The color scale on the large geological map which accompanies Mr. Hall's report, seems to the stranger not to agree with the color as used on the map. On the former the intermediate Manayunk belt is designated by dark red, whereas on the map this color seems to be given to the northerly Chestnut Hill group, and *vice versa*.

The last forty pages contain the report of Dr. Genth on the dolerites, mica schists, gneisses, granites and other rocks of the district, and constitutes a very valuable leaf in the still small book of chemical lithology.—*P. F.*